



## **Announcement Request for Applications BIO-02-91**

# **Identification and Evaluation of Biological Indicators of Terrestrial Ecosystem Stress**

Receipt Date March 15, 1991

### **I. Background**

Ecosystems and their component organisms are continually exposed to stresses, both natural and anthropogenic. One task of the Environmental Protection Agency (EPA) is to determine whether systems are sufficiently stressed by anthropogenic agents to cause damage. Problems to be addressed by scientists are the difficulty in detecting stress and to identify the causative stressors. These problems are particularly acute because of the interactive nature of stress, in which multiple anthropogenic factors act in an integrated manner with multiple natural stressors.

The following is presented as a conceptual basis for a research program to address these problems. Organisms exposed to stress undergo a predictable sequence of changes in response to stress. At low to moderate levels of stress, behavioral responses (avoidance), acclimation (physiological response), and compensation occur. Acclimation and compensation allow organisms to continue functioning while exposed to a stressor, but growth and allocation costs are incurred. At some level of stress, adaptation (genetic response) occurs. When the stress exceeds the ability of organisms to acclimate, or exceeds the ability of populations to adapt, damage occurs. Each of these processes produces measurable changes in ecosystems, populations, or organism states and processes. Detection of acclimation or compensation could serve as an early warning, which would trigger more intensive monitoring of a system. These changes may or may not result in degradation, but they may provide information about causal factors.

Distinguishing ecological responses associated with anthropogenic stresses from natural stresses is the central step in the proposed strategy for characterizing ecological responses to human activities. Experience has shown that this is a difficult task because of the inherent uncertainties and the lack of an adequate baseline data for monitoring a single ecological system or for system comparisons. Consequently, this area of ecological research requires special attention. Only through distinguishing anthropogenic stress responses from other stress responses can causal factors be inferred that specifically relate ecosystem damage to human activity.

The development of new tools and criteria for detecting stress and determining the cause(s) would enhance the ability of EPA to assess the impacts of anthropogenic stress and would play a particularly important role in early detection of ecosystem change due to stress.

### **II. Scope**

The purpose of this Request for Application (RFA) is to promote research on identifying and evaluating biological indicators of ecosystem stress responses in terrestrial environments.

An indicator is a specific organism (plant or animal) or measure (proteins, lipids or other macromolecules) that characterizes an endpoint, either directly (e.g., the population level or an endpoint species) or indirectly (e.g., coliform count as an indicator of water contamination). Ecological research is needed to identify the types of indicators that are appropriate for different ecosystems and the particular types of indicators most appropriate for characterizing endpoints. Of particular importance are those biological indicators and endpoints which can distinguish between anthropogenic and natural disturbances.

For the purposes of this RFA, the focus should be limited to biological indicators applicable to terrestrial ecosystems including forests, soils, grasslands, deserts, etc., or other relevant terrestrial systems not described in this announcement.

### **III. Mechanisms of Support**

Assistance under this RFA will be provided by a research grant, administered through EPA's investigator-initiated research grants program. The applicant will be responsible for the planning, direction and execution of the proposed research. Support under this program is limited to non-profit organizations and educational institutions.

Approximately 1.0 million dollars will be available from fiscal 1991 funds, and it is estimated that about ten projects will be supported. Each project will be supported for a period

of two years at approximately \$100,000 per year. This RFA is for a single competition with a deadline of March 15, 1991.

#### IV. The Application

Each application will consist of **APPLICATION FOR FEDERAL ASSISTANCE** forms (standard forms 424 and 424A), separate sheets providing the budget breakdown for each year of the project, curriculum vitae for the principal investigator, abstract of the proposed project, and a project narrative. All certification (drug-free workplace, etc.) forms must be signed and included with the application. Attachments, appendices or other materials included in addition to those identified above will not be forwarded to the reviewers. Application forms, instructions, and other pertinent information are contained in the federal grant application kit obtainable from:

Research Grants Staff (RD-675)  
U.S. Environmental Protection Agency  
401 M Street, SW  
Washington, DC 20460

or by calling on (202) 382-7445.

#### V. Special Instructions

1. The project narrative or proposal must not exceed 30 single sided 8-1/2 by 11 inch pages. Typeface must be standard 10-12 characters per inch.
2. CVs or resumes must not exceed two pages for each principal investigator and should focus on education, position held, and most recent or related publications.
3. Project periods will be for two years.
4. Applications in response to this RFA must be identified by printing "RFA BIO-02-91" in item 10 on the face page of form 424 or in item 3 if you are using the old form 5700-12. The absence of this identifier from an application absolves EPA of any responsibility if it is not reviewed along with the other applications responding to this RFA.

#### VI. Application Review

All applications in response to this solicitation will be reviewed at a single meeting of a scientific peer panel which will evaluate and rank each proposal according to its scientific merit as a basis for recommending agency approval or disapproval. The panel will consider:

- quality of research plan (including theoretical and/or experimental design, originality, and creativity),
- qualifications of the research team,
- availability and adequacy of facilities and equipment, and
- appropriateness of the proposed budget.

#### VII. Application Submission

The original and eight copies of the application must be received no later than the close of business March 15, 1991, to be considered. The applications must be sent to:

Grants Operation Branch (PM-216F)  
Grants Administration Division  
U.S. Environmental Protection Agency  
401 M Street, SW  
Washington, DC 20460

or for overnight express mail, the address is:

Grants Operations Branch  
Grants Administration Division  
U.S. Environmental Protection Agency  
499 South Capital Street, SW  
Washington, DC 20460  
(202) 382-5266

#### VIII. Staff Contact

Questions relating to this solicitation may be directed to Clyde Bishop by telephone on (202) 382-7445.

United States  
Environmental Protection  
Agency

Center for Environmental Research  
Information  
Cincinnati, OH 45268

**BULK RATE  
POSTAGE & FEES PAID  
EPA PERMIT NO. G-35**

Official Business  
Penalty for Private Use \$300

EPA/600/9-90/051